PATENT SPECIFICATION

(11) 1 387 357

(19)

1 387 357

(21) Application No. 55064/72 (22) Filed 29 Nov. 1972

(23) Complete Specification filed 27 Nov. 1973

(44) Complete Specification published 19 March 1975

(51) INT. CL.[2] F16K 31/18

(52) Index at acceptance
F2V E1L1 F3A F3F F3J F7B

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(54) LIQUID LEVEL CONTROL VALVE

(71) I, MARGARET SHARMAN, a British subject of "Westgate", Winterborne Stickland, Blandford Forum, Dorset, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a flow control valve for controlling flow of liquid into a container to maintain said liquid at a predetermined level.

In liquid supply installations where the liquid is stored in a storage tank and is fed therefrom to one or a plurality of smaller subsidiary tanks provided with such a flow control valve for use, it is important to ensure that if the flow control valve fails for any reason that means are available for shutting off the connection to the subsidiary tank upstream of the flow control valve in order to prevent the liquid overflowing from the subsidiary tank. Such means usually comprise separate valve means and if such separate valve means are to be operated automatically if the level of liquid in the subsidiary tank rises above the predetermined level the cost and complexity of the installation increases. Such an installation may comprise a storage tank for paraffin which is supplied to one or a plurality of paraffin burning appliances having a subsidiary tank or the installation may comprise a storage tank for water fed to one or a plurality of drinking water containers in a bird or animal rearing house.

According to the present invention there is provided a flow control valve for controlling flow of liquid into a container to maintain said liquid at a predetermined level, comprising a body member provided with a flow passage having an inlet and an outlet, a valve member for controlling the outlet, means for moving the valve member in dependence upon the level of liquid in the container, a collapsible tube forming at least part of said flow passage and means for collapsing said tube in the event of the liquid level rising above said predetermined level.

Preferably said means for moving the valve member comprises a float operated mechanism.

The means for collapsing said tube preferably comprises a plunger member mounted in said body adjacent said tube and movable by resilient means into contact with said tube to cause it to collapse, retaining means being provided for preventing such movement, and means for withdrawing said retaining means if the liquid level in the container rises above said predetermined level to allow said plunger to be moved by the resilient means to collapse said tube to prevent liquid flowing therethrough.

Some embodiments of the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a longitudinal cross-section through a first embodiment of a flow control valve according to the present invention; and

Figure 2 is a longitudinal cross-section through a second embodiment.

The flow control valve shown in Figure 1 has a body 10 moulded in plastics material in which is formed a flow passage 11 having an inlet connection 12 and an outlet 13. The flow passage 11 is formed by a collapsible tube 14 formed of rubber or plastics material which is attached to the inlet connection 12. Co-operating with the outlet end of the tube 14 is a valve member 15 provided on a pin 16. The valve member 15 is urged towards the position in which it closes off the outlet end of the tube 14 by means of a spring 17.

Rotatably mounted on the body 10 is a cam member 18 which comprises a cylindrical member having a transverse bore 19. The free end of the pin 16 is bent through a right angle and is received in the bore 19. Connected to the member 18 is an arm 20 which carries at its other end a float 21. As the float 21 rises with the level of liquid the valve member 15 is moved by the spring 17 to reduce or completely shut off the supply of liquid from the outlet end of the tube 14. Conversely, as the liquid level falls the member 18 will be rotated and will act on the bent portion of the pin 16 to pull the pin 16 downwardly against the force of the spring 17 to move the valve member 15 away from the outlet end of the tube 14. Under normal operating conditions this modulation of the liquid flow will continue indefinitely to maintain the liquid level in a tank or container at a predetermined level.

The body 10 is provided with a transverse bore 22 whose inner end is open to the side of the tube 14. Slidably mounted in the bore 22 is a plunger 23 provided on its cylindrical surface with an annular recess 24. The plunger 23 is provided with a longitudinally extending bore 25 in which is received a spring 26 which abuts against a closure member 27 provided in the outer end of the bore 22. Secured to the plunger 23 is a ring 28 which extends through the closure member 27. Extending through a bore provided in the body 10 is a pin 29 which has one end engaged in the recess 24 of the plunger 23 to hold the plunger 23 against the force applied by the spring 26 in a position where it does not deform the tube 14. The outer end of the pin 29 is bent through a right angle and is received in the bore 19 of member 18. The bore 19 is larger in diameter than the ends of the pins 16 and 29 so that rotation of the member 18 effecting operation of the valve member 15 does not effect movement of the pin 29.

If due to failure of the valve member 15 to fully close off the outlet end of the tube 14 liquid continues to flow threthrough when the valve member has reached its "closed" position, the liquid level in the container or tank will rise above the predetermined level and thus the float 21 will rise and the member 18 will move the pin 29 downwardly thus disengaging it from the groove 24. The plunger 23 will move under the influence of the spring 26 and will collapse the tube 14 sufficiently for the tube 14 to be closed and cut off the liquid flow therethrough at a point located upstream of the outlet end. After the fault causing failure of the valve member 15 has been remedied the plunger 23 is retracted by pulling on the ring 28 and the pin 29 is re-engaged with the groove 24.

If the tube 14 becomes damaged or worn it can easily be replaced.

In a modified arrangement the valve member 15 is replaced by a lever operated by the cam 18, said lever acting on the side of the tube 14 to collapse the tube 14 in order to moderate liquid flow therethrough.

The flow control valve shown in Figure 2 has a body 30 moulded in plastics material and in which is formed a flow passage 31 having an inlet connection 32 and an outlet 33. The flow passage 31 is formed by a collapsible tube 34 formed of rubber or plastics material which is attached to the inlet connection 32. Co-operating with the outlet end of the tube 34 is a valve member 35 provided with a stem 36. The stem 36 is connected to an arm 37 provided with a float 38. A pin 39 acts as a stop to limit the lowermost position of the valve member 35. Connected to the body 30 is a housing 40 in which is housed a plunger 41 provided with a circumferential groove 42. The plunger 41 is provided at its free end which protrudes through the end of the housing 40 with a knob 43 and the plunger is acted upon by a spring 44. Extending through a bore in the body 30 is a pin 45 having one end received in the groove 42 and its other end connected to the arm 37, a spacer sleeve 46 being provided on the arm 37 between the stem 36 and the pin 45.

Secured to the body 30 is an adapter member 47 provided with a clamping ring 48, the adaptor member 47 being used to mount the body 30.

Under normal operating conditions the float 38 will rise and fall with the rise and fall of the level of liquid in the tank or container and the arm 37 will pivot about the end of the pin 45 to thus raise and lower the valve member 35 to effect modulation of the liquid flow through the outlet end of the tube 34.

If for any reason the valve member 35 fails to completely shut off the outlet of the tube 34 when the liquid level in the container reaches the predetermined level, the float 38 will continue to rise and the arm 37 will pivot about its connection with the stem 36 and thus lower the pin 45 disengaging it from the plunger 41. The plunger 41 will then move under the force of the spring 44 to collapse the tube 34 thus cutting off the supply of liquid upstream of the valve member 35.

WHAT I CLAIM IS:—

1. A flow control valve for controlling flow of liquid into a container to maintain

said liquid at a predetermined level, comprising a body member provided with a flow passage having an inlet and an outlet, a valve member for controlling the outlet, means for moving the valve member in dependence upon the level of liquid in the container, a collapsible tube forming at least part of said flow passage and means for collapsing said tube in the event of the liquid level rising above said predetermined level.

2. A flow control valve as claimed in claim 1, in which said means for collapsing said tube comprises a plunger member mounted in said body adjacent said tube and movable by resilient means into contact with said tube to cause it to collapse, retaining means being provided for preventing such movement and means for withdrawing said retaining means if the liquid level in the container rises above said predetermined level to allow said plunger to be moved by the resilient means to collapse said tube to prevent liquid flowing therethrough.

3. A flow control valve as claimed in claim 2, in which said plunger is provided with a recess and said retaining means comprises a pin slidably mounted in said body member and engageable in said recess and said means for withdrawing said retaining means comprises said means for moving the valve member in dependence upon the level of liquid.

4. A flow control valve as claimed in any preceding claim, in which said means for moving the valve member comprises a float operated mechanism.

5. A flow control valve as claimed in claim 3, in which said means for moving the valve member comprises a float, an arm connected to said float, a member rotatably mounted on said body and to which said arm is connected, a pin connected to said valve member and engageable by said rotatably mounted member to move the valve member and said retaining means comprises a pin slidably mounted in said body member and engageable in said recess, said pin being engageable by said rotatably mounted member to be moved thereby when the float rises above said predetermined level.

6. A flow control valve as claimed in claim 5, in which said rotatably mounted member comprises a cylindrical member provided with a transverse aperture into which bent portions of said pins engage, said aperture having a larger transverse dimension than the thickness of each bent portion.

7. A flow control valve as claimed in any preceding claim, in which said valve member is resiliently loaded in the direction of closing.

8. A flow control valve as claimed in claim 3, in which said means for moving the valve member comprises a float, an arm connected to said float, said arm being pivotally connected to one end of a pin connected to said valve member, and said retaining means comprises a pin slidably mounted in said body member and having one end engageable in said recess and its other end pivotally connected to said float arm, said float arm being caused to pivot about its connection with said retaining pin in order to move said valve member and being caused to pivot about its connection with the pin of the valve member in order to retract said retaining pin.

9. A flow control valve as claimed in any preceding claim, in which said valve member co-operates with the outlet end of the collapsible tube.

10. A flow control valve member as claimed in claim 2 and any claim dependent thereon, in which said plunger is provided with a handle, knob or the like enabling it to be moved manually against the force of the resilient means.

11. A flow control valve member as claimed in any preceding claim, in which said tube is formed of rubber or plastics material.

12. A flow control valve member for controlling flow of liquid into a container to maintain said liquid at a predetermined level, substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

13. A liquid supply installation including a flow control valve member as claimed in any preceding claim.

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Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1975.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1387357 COMPLETE SPECIFICATION

1 SHEET This drawing is a reproduction of the Original on a reduced scale

FIG. 1.

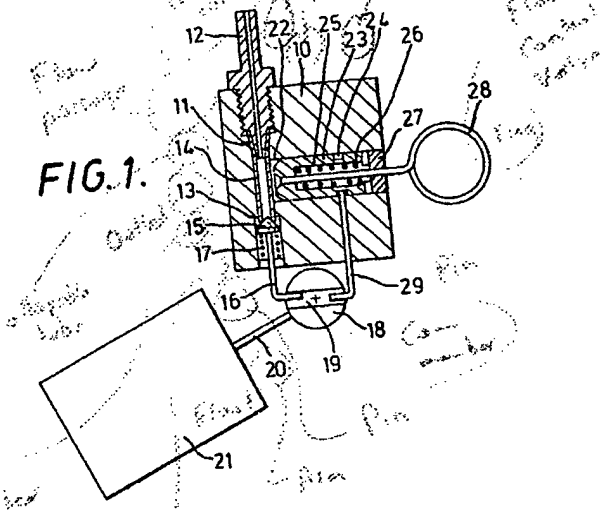

FIG. 2.